



AUTERA

New high-performance product family for data-driven developments for autonomous driving

Environment perception sensors are critically important to the operation of autonomous vehicles. These sensors generate ever growing volumes of data. With the AUTERA product family, dSPACE now offers a system that can read, process, and record raw sensor data from lidar, radar, and camera sensors as well as from automotive buses and networks, with best-in-class bandwidth.

Autonomous vehicles feature a large number of high-resolution sensors used to perceive their surroundings. These sensors create multiple data streams, which have to be merged into an overall environment image. This overall picture of the operating environment then has to be made available for other algorithms

such as trajectory planning. Object recognition and sensor fusion are frequently aided by artificial intelligence (AI). To develop, train, and test the complex AI-based systems, a sizeable quantity (petabytes) and quality of data collected during real test drives is required. Therefore, recording all relevant data plays an essential role

in this data-driven development process. The special challenge is to meet the ever-increasing demand for bandwidth. Therefore, a recording system must not only be scalable, it must also be flexibly configurable so that it can be adapted to a variety of vehicle configurations, such as sensor interfaces, buses, and networks.



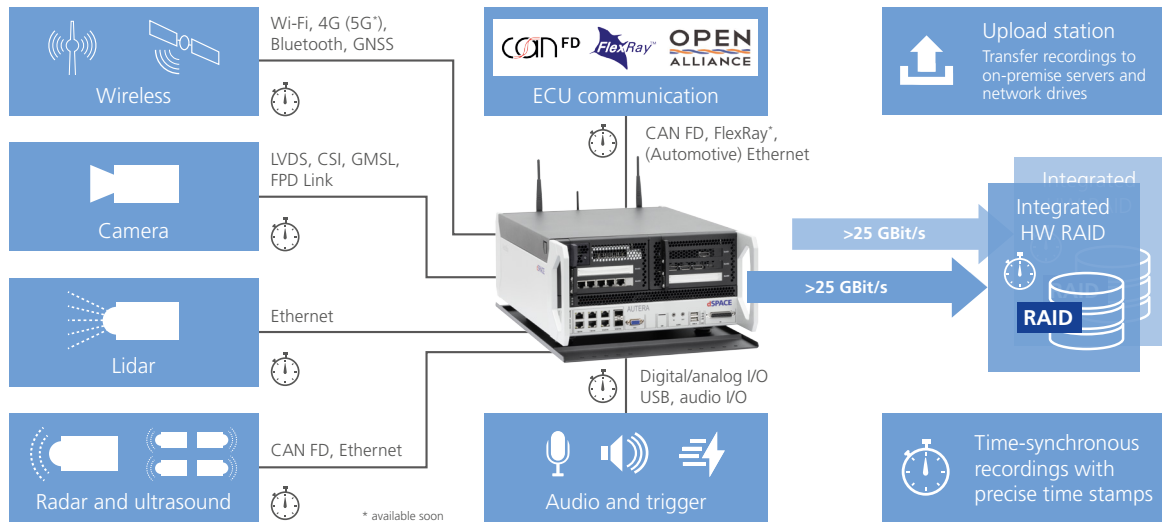
New System for Data Logging, Processing, and Replay

To meet these demands, dSPACE introduces a new, extremely powerful product family for data recording and prototyping in the vehicle, and subsequent playback of data in the lab: AUTERA. The name AUTERA stands for AUTonomous ERA. It describes products that are specially designed for developments in autonomous driving (AD) and advanced driver assistance systems (ADAS). The first system of the new AUTERA pro-

duct family is the AUTERA AutoBox, a robust in-vehicle system. The AUTERA AutoBox is the ideal system for recording and processing large volumes of data from various sensors, automotive buses, and networks during test drives. In addition to CAN FD, the AUTERA AutoBox supports Ethernet (1000BASE-T, 10GBASE-T), and automotive Ethernet (100/1000BASE-T1), as well as various raw data interfaces such as GMSL II, FPD Link III or CSI II for camera sensors. All these interfaces are synchronized and record accurate time

stamps directly at the data input location so that the data can then be played back with correct timing. In addition to the computing power of the system, the bandwidth is also a decisive factor as it determines the number of high-resolution sensors that can be recorded simultaneously. The AUTERA AutoBox is capable of continuously streaming up to 50 Gbit/s to the easily exchangeable and hot-swappable AUTERA solid-state disks (SSDs) within a compact system. If this extremely high bandwidth is not suf- >>

AUTERA: The power of a Linux server - in the vehicle.



Example setup: AUTERA impresses with versatile connection options, enormous computing power, and almost inexhaustible memory.

ficient, you can simply scale it by adding another AUTERA AutoBox. The stored data can be replayed for neural network training, scenario generation, homologation, etc.

Ready-to-Use Solution

The AUTERA AutoBox is delivered with a Linux operating system and all required drivers are pre-installed for immediate operation. Moreover, the multisensor development environment RTMaps on AUTERA makes complex relationships manageable with simple graphical methods and visualization of data streams from the connected

sensors. It also provides intuitive data fusion and recording capabilities. However, RTMaps is but one of many options. The Linux operating system of the AUTERA AutoBox is also compatible with other software solutions, such as the Robot Operating System (ROS) framework. Additionally, an open API will be provided in the future, enabling customers to use all relevant interfaces and services of the system in their own software environment.

AUTERA Is Flexibly Expandable

One strength of AUTERA is its numerous expansion options. AUTERA archi-

ture allows users to configure systems to cover a wide range of tasks: from data recording with high-performance memory to prototyping of AI algorithms with dedicated hardware accelerators, such as graphics processors (GPUs) and playback of the recorded data.

Expansion options for AUTERA include:

High-performance hardware accelerators

To edit the sensor data during recording, AUTERA can be extended with a

Product Profile: AUTERA

Product class: Data logger, replay, and prototyping system for multisensor applications

Key Functions

- Powerful, expandable system that delivers the performance of a Linux server in a robust chassis for in-vehicle use
- Synchronous processing and data recording of environment sensors and automotive buses
- Flexibly expandable with hardware accelerators for data preprocessing and data fusion
- Hot-swappable AUTERA SSD for easy memory exchange while recording a test drive
- Support of raw data interfaces for environment perception sensors such as GMSL II, FPD-Link III, or CSI II
- Open system with the intuitive graphical software environment RTMaps for the block-based implementation of algorithms or the option to use open APIs in user-specific software environments

fast computing platform based on graphics processing units (GPUs) or field-programmable gate arrays (FPGAs). This allows for data to be preprocessed or labeled during the logging test run. Therefore, you can also use the system for developing, optimizing, and validating perception and fusion algorithms as well as neural networks.

Easy memory expansion

Data is stored on a dedicated, high-performance AUTERA SSD that can be easily hot-swapped during operation. Up to two AUTERA SSDs can be operated in parallel on each AUTERA AutoBox to double bandwidth and storage space. In addition, several AUTERA systems can be operated synchronously so that the memory size and bandwidth can be scaled, as needed.

Fastest upload to the server

dSPACE will offer a dedicated AUTERA upload station to load the recorded data to an existing server infrastructure or the cloud as quickly as possible. It can read up to two AUTERA SSDs simultaneously and streams the data directly to the data center, for example, via 100 Gigabit Ethernet. In addition, the AUTERA AutoBox can be accessed directly via LTE during the recording of the test drive to immediately receive data. In the future, 5G access will also be available.



AUTERA has a memory solution (SSD) that can be easily replaced during operation.

Simple fleet management

Managing and updating the configuration of a larger fleet of vehicles to record data without a centralized access is often complex and time-consuming. Therefore, in the future, dSPACE will offer a web-based solution for managing AUTERA AutoBox systems in vehicles. This solution will help monitor the current status of the system from a central workstation, detect fault status, and determine the current position of the AUTERA AutoBox. At a later stage, the configuration of the system can also be updated centrally and rolled out to the entire fleet. ■

Technical Data

- Logging bandwidth: up to 50 Gbit/s
- Storage capacity: up to 32 TB
- Processor: Intel® Xeon® CPU with 12 cores
- RAM: 32 GB, up-to 512 GB on request

More information:

www.dspace.com/go/dMag_20193_AUTERA



For sensor data preprocessing, AUTERA can be equipped with a powerful graphics card, such as the NVIDIA Quadro RTX 6000.

Use Cases for AUTERA

Data Logging

- Gathering reference data
- Vehicle and ECU tests

Prototyping

- Sensor fusion
- Perception

Data Replay

- Validating AI algorithms